

Benjamin C. STONE & A. H. LOO*: **Cytotaxonomic notes
on some species of *Polyscias* (Araliaceae)**

B. C. ストーン・A. H. ロー: タイワンモミジ属 (ウコギ科) の
細胞分類学的研究

Cultivars of the *Polyscias* are very common in the Old World Tropics, in most villages, towns, and cities. The rather great diversity of leaf form is perhaps the main reason for their popularity. They are easily grown from stem cuttings, and are no doubt almost invariably propagated in this manner. The production of flowers is uncommon in many cultivars, and it is likely that some are entirely incapable of flowering. In a few, however, floral initiation is usual, and begins early. In others, flowering has been observed, but only in conditions of considerable age, and thus of unusual size; flowering may be repressed by growth in pots.

The taxonomic status of many of these cultivars, and others in the family, has been subject to some controversy. In a fair number of cases, the original name of the plant is horticultural in origin; the genera most often referred to in early works are *Aralia* and *Panax*. Botanical work has in many cases shown that these plants have been wrongly allocated to these genera. That the species considered here are all members of the same genus, *Polyscias*, is due to a fairly long history of study, and some have a long list of synonyms. Besides *Aralia* and *Panax*, the genera that require mention here are *Nothopanax* Miq. and *Tieghemopanax* Vig. It will be seen that the problem of cultivars, especially their generic affinity, has been and to some extent still is a problem, which has confused various workers. Unfortunately it has also led to some misplaced remarks on generic status in this family. This topic is dealt with at the end of this paper.

This paper reports the chromosome number and morphology of six cultivars of *Polyscias* belonging to three species, as follows:

* School of Biological Sciences, University of Malaya, Kuala Lumpur, Malaysia.

This paper is based on an Honours Project Report submitted by the junior author (Loo Ai Hwa) to the Botany Unit, School of Biological Sciences, University of Malaya, in the academic year 1967-68.

Table 1.

Species	Cultivar	2n (Somatic chromosome number)
<i>P. fruticosa</i>	"A"	24
" "	"B" (? cv ' <i>filicifolia</i> ')*	24
<i>P. guilfoylei</i>	cv " <i>laciniata</i> "	24
<i>P. scutellaria</i>	cv " <i>scutellaria</i> "	24
" "	cv " <i>trichochleata</i> "	24
" "	cv " <i>multifida</i> "	24

* Correct species attribution of this cultivar is uncertain.

The three species utilized here are commonly cultivated in Malaya, and our material was all from local sources near the University campus. Cuttings of each cultivar were taken, planted in sand, and after 2 to 3 weeks' growth, they were treated for 3 hours with 0.25% colchicine. Root-tips were cut at 1p.m. and immediately fixed in Farmer's fluid (3:1 alcohol-acetic acid) and kept overnight; then stored in 70% alcohol, or stained and squashed immediately. Both Feulgen and aceto-orcein stains were used; the latter gave better results. Slides were made permanent by using an alcohol and cedar-wood oil series. Voucher specimens are preserved in the University of Malaya Herbarium (KLU).

Results (1) *Polyscias fruticosa* (L.) Harms cv "A".

Somatic number from root-tips: $2n=24$.

Gametic number from pollen mother-cells: $n=12$.

Notes on karyotype: 4 chromosomes with secondary constrictions; 8 small acrocentrics; 12 medium chromosomes all acrocentric except 1 pair.

Notes on meiosis: At diakinesis of prophase I, 12 bivalents were observed. There were more ring than rod formations. At metaphase I, non-congressionals were observed. In about 25% of the cells at metaphase I, there was 1 pair of non-congressionals; in about 15%, there were two such pairs. The remaining 60% showed no non-congressionals. These non-congressionals usually lie without the spindle, but may be within it but away from the main group at the equatorial plate. Separation at anaphase may be equal or unequal. The segregation may produce groups of 12 and 12, or 11 and 11 with 1 pair of non-congressionals, or one group may have ten, the

other fourteen chromosomes. During metaphase II, besides normal cells, there were observed groups of varying number. The results of meiosis are thus rather irregular. The non-congressionals may be included, however. Although Sharma & Chatterji (1964) reported non-disjunction at anaphase I in this species, we did not notice this.

(2) *P. fruticosa* cv "B" (*filicifolia* ?)

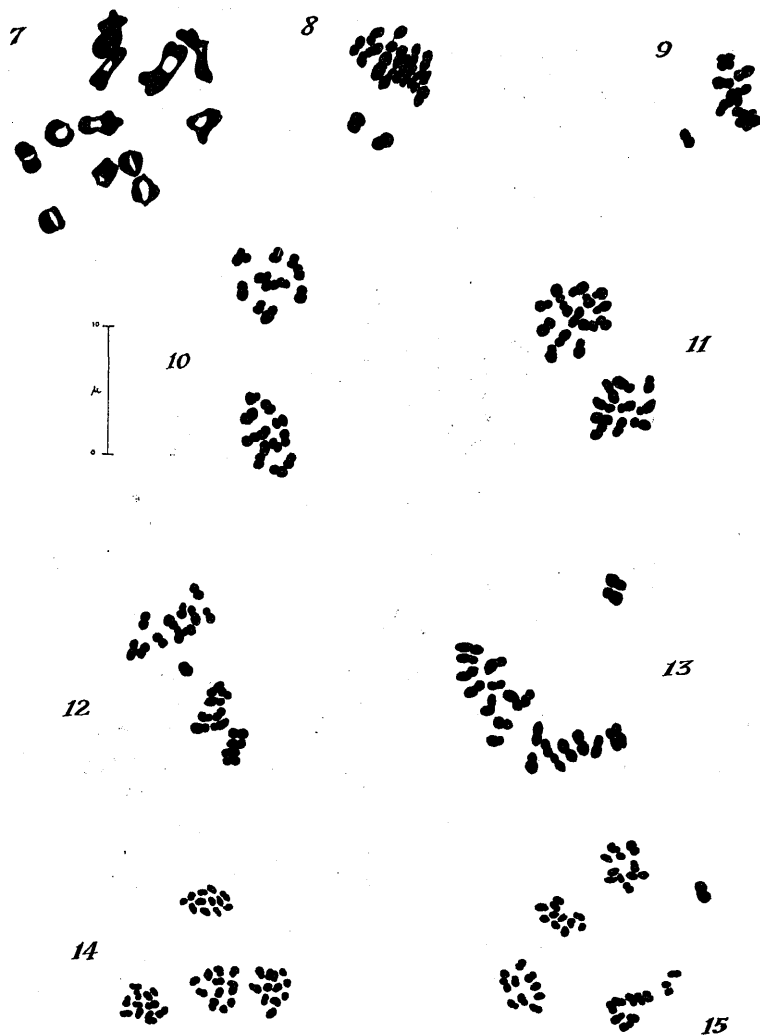
Somatic number from root-tips: $2n=24$.

Notes on karyotype: 10 small chromosomes; 14 medium chromosomes; of the latter, 1 pair possesses secondary constrictions. The majority are



Figs. 1-6. C-metaphases in root-tips of *Polyscias* species.

1. *P. fruticosa*. 2. *P. fruticosa* cv "B". 3. *P. guilfoylei*. 4. *P. scutellaria* cv "tricochleata". 5. *P. scutellaria* cv "multifida". 6. *P. scutellaria* s.s.



Figs. 7-15. Meiosis in pollen mother cell of *P. fruticosa*.
 7. Prophase I, diakinesis, 12 bivalents. 8. Metaphase I with 1 non-congressional pair.
 9. Metaphase II with 2 non-congressional pairs. 10. Anaphase I, regular $n=12$ at each pole. 11. Anaphase I, irregular, 14 chromosomes at one pole, 10 at the other. 12. Metaphase II with 1 non-congressional pair. 13. Metaphase II with 2 non-congressional pairs. 14. Anaphase II, regular, $n=12$. 15. Anaphase II with 1 non-congressional pair.

acrocentrics.

- (3) *P. guilfoylei* (Cogn. & March.) L.H. Bailey cv "*laciniata*"

Somatic number from root tips: $2n=24$.

Notes on karyotype: 2 chromosomes with constrictions; 18 medium: 4 slightly smaller; size differences not marked.

- (4) *P. scutellaria* (Burm. f.) Fosberg

Quite recently this species has been merged with *P. pinnata* Forst. (Smith and Stone 1968), on the basis of floral morphology.

cv "*scutellaria*"

Somatic number from root tips: $2n=24$.

Notes on karyotype: 4 chromosomes with secondary constrictions; 4 small chromosomes, 16 medium.

- (5) *P. scutellaria* cv "*trichochleata*"

Syn.-*P. pinnata* cv "*trichochleata*" (Cf. Stone 1965a, 1965b).

Somatic number from root tips: $2n=24$.

Notes on karyotype: Fourteen medium chromosomes, two with secondary constrictions; ten small chromosomes.

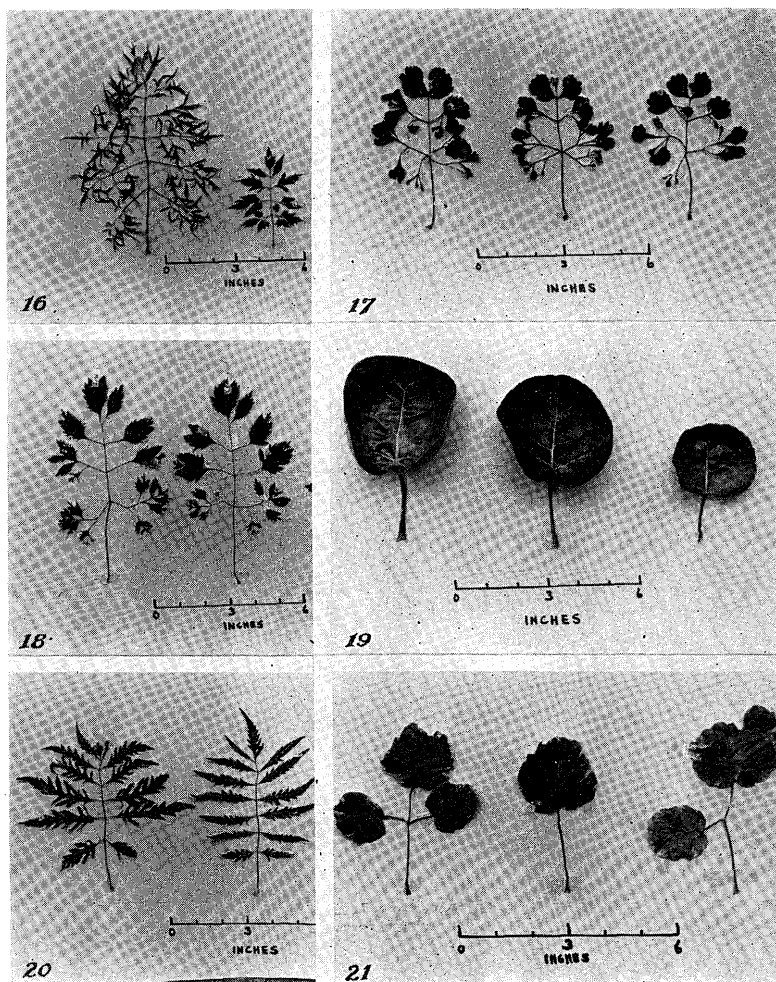
- (6) *P. scutellaria* cv "*multifida*". Syn.-*P. pinnata* cv "*multifida*".

Somatic number from root tips: $2n=24$.

Notes on karyotype: Twelve medium chromosomes, without secondary constrictions; ten small chromosomes; two medium chromosomes with secondary constrictions.

Discussion In a rather ambitiously titled paper, Sharma and Chatterji (1964) presented cytological data drawn from, allegedly, two genera (representing two sections of the family), namely *Aralia* L. and *Polyscias* Forst., and five different species. On this basis they attempted to show how cytological study is "an aid in the interpretation of the systematic status of the different genera of Araliaceae" (to quote from their article).

In their summary, these authors note that all counts showed $2n=24$, except one cultivar, which was *P. guilfoylei*, that showed $2n=36$. They also noted a difference in the size of pollen grains produced by *P. fruticosa*, which is no doubt associated with the irregularities in meiosis and the chromosome number of 22, as earlier reported by Gopinath (1944). They conclude $x=12$ as a basic set in the family Araliaceae. To all these conclusions we can agree.



Figs. 16-21. Leaves from representative cultivars of *Polyscias*.

16. *P. fruticosa*. 17. *P. fruticosa* cv 'B'. 18. *P. guilfoylei* cv. 19. *P. scutellaria* s.s. 20. *P. fruticosa* cv "filicifolia". 21. *P. scutellaria* cv "tricholepta".

We wish to point out that the intention of these authors is blocked by the fact that they dealt with not two genera, as they claimed, but only one. Reviewing the list of species which they give it is evident that all their cited materials belong properly to the genus *Polyscias*. Their *Aralia balfour-*

iana Sander is actually *Polyscias balfouriana* (Sander) L. H. Bailey, and is an excellent example of a species assigned by early horticultural practice to a wrong genus. The same may be said of the material which Sharma and Chatterji refer to *Aralia racemosa* L. This is misidentified; again the material belongs to *Polyscias*. Their remaining species of *Polyscias* are apparently correctly determined: *P. fruticosa*, *P. guilfoylei*, and *P. pinnata*, which we now equate with *P. scutellaria*.

It is therefore obvious that their cytological data, which seems accurate, refers only to the genus *Polyscias*. Their conclusion, therefore, that the "different genera of the family are very much interrelated" which rather vague is hardly well founded. Until chromosome numbers of a much larger number of genera are known, not much speculation is justified. Genera such as *Acanthopanax*, *Arthrophyllum*, *Dendropanax*, *Brassaioopsis*, *Plerandra*, *Schefflera*, *Wardenia*, *Dizygotheca*, *Tetraplasandra*, *Reynoldsia*, and the many others in the family, may yet reveal a greater range of chromosome number than is presently known. For further data on *Polyscias* and its generic synonyms and position, see Smith and Stone (1968), Stone (1965a, 1965b).

References

- Gopinath, D.M. 1944. Proc. Ind. Acad. Sci. B, 20: 175. Sharma, A.K. & Chatterji, A.K. 1964. Cytological study as an aid in the interpretation of the systematic status of the different genera of Araliaceae. *Cytologia* 29: 1-12. Smith, A.C. & Stone, B.C. 1968. The Araliaceae of the New Hebrides, Fiji, Samoa and Tonga. *J. Arnold Arb.* 49(4): 431-493, 8 pls. Stone, B.C. 1965a. Notes on the type species of *Polyscias* J.R. & G. Forster. *Taxon* 14(8): 231-245. — 1965b. Notes on *Polyscias* (Araliaceae) from Micronesia. *Micronesia* 2: 52-59.

* * * *

ウコギ科のタイワンモミジ属の6園芸品種について、染色体数と核型とを報告する。すべて $2n=24$ で、従来の報告と一致し、3倍体は見出されなかった。6品種は3種にまとめられるが、其中で *Polyscias fruticosa* (タイワンモミジ) の減数分裂を追跡した。他は全部根端細胞による結果である。これら品種間での遺伝的相異は染色体構造の改変によるものゝようである。核型分化の役割に対する論評を加え、科内の属の資格を判断する場合、その一助としての細胞学的検討についても意見を述べた。